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THE CEMENT INDUSTRY:
Economic Impact of Pollution Control Costs

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THE CEMENT INDUSTRY:
ECONOMIC IMPACT OF POLLUTION CONTROL COSTS

EXECUTIVE SUMMARY

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by

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EXECUTIVE SUMMARY

THE PRODUCT

Portland cement is a powder which when mixed with water will bind sand and stone into a hardened mass called concrete. Portland cement concrete is a widely used construction product because of its low cost, high compressive strength, and durability. It is used, in varying amounts, in all major forms of construction--highway, residential, industrial, commercial, and public works. Grey portland cement, the most common form, is a low priced, relatively undifferentiated commodity selling for approximately one cent per pound. Its low value-to-weight ratio has meant land transportation, storage, and distribution costs are high relative to most other manufactured products.

THE MARKET

Cement consumption in the U.S. reached 417 million barrels (78.5 million short tons) in 1969. The major end uses are as follows:

	% of total
Residential Construction	23
Streets and Highways	19
Bridges, Airports, and Other Public Works	14
Schools and Other Public Buildings	14
Industrial and Commercial	21
Farms and Miscellaneous	9
	100%

Most cement, about 60 percent of the total, is shipped to ready-mix concrete firms who supply construction projects in the above categories in a regional metropolitan market. Lesser amounts of cement are sold to manufacturers of concrete building products such as block, pipe, pre-cast panels, etc.; to highway contractors; and to building material dealers. Most shipments are now in bulk by truck, which has largely replaced rail shipment. Cement is also shipped in bags (of 94 pounds), and water transportation by barges has been increasingly used.

Cement demand is closely tied to overall construction activity. Some construction projects (e.g., dams and roads) use proportionately more cement than others (e.g., single-family residences), but the demand for different types of construction projects is closely interrelated so that overall cement usage is closely correlated with aggregate construction activity. Usage currently amounts to about 6.5 barrels for each $1000 of total construction, expressed in constant (1957-1959) dollars. This ratio has been rising slightly from 5.8 to 6.5 barrels per $1000 since 1953, as cement has gradually displaced other building products with which it competes in some applications. This has been due both to the widening price advantage of concrete relative to steel and to its suitability for factory prefabricating methods, as in the case of pre-cast and pre-stressed building components.

Overall demand growth has been low; about 2.8 percent per annum in volume for 1953-1969. A projected higher growth in construction activity will accelerate the growth somewhat to 3.4-4.1 percent per annum in the 1971-1980 period. Shifts in end use and customer type will be very moderate, although the trend to increased shipments to ready-mix dealers will continue.

THE INDUSTRY

There are about 180 cement plants owned by 51 companies in the U.S., located in 40 states. Fifty percent of industry capacity is owned by multiplant companies, the remainder by companies with only one plant. Ownership patterns vary and include divisions of diversified companies, large cement users, and independent companies. The largest company accounts for about eight percent of U.S. capacity, the leading eight companies together about 47 percent. There is a trend toward increasing concentration in medium-sized cement producers, with small one-plant companies slowly disappearing.

Due to high transportation charges (typically one-eighth to one-fourth of delivered price), the prevailing industry pattern has been regional. Some sparsely populated, relatively isolated parts of the U.S., such as in the Southwest and Mountain states, are served by smaller plants of up to two million barrels annual capacity. Larger metropolitan areas of the East, California, and the Midwest are served by a combination of older, small plants of one to three million barrels capacity and some larger, newer plants generally with capacities of five million barrels or more. Small plants tend to ship direct to customers, whereas larger plants, requiring wider market areas, often ship through distribution terminals located in major consuming centers. There has been a steady increase in the proportion of cement shipped to terminals, as a result of favorable bulk shipping costs from plant to terminal, a demand for faster service, and as a result of efforts of larger plants to increase their share of regional markets.

Cement manufacture is highly capital intensive, with a typical sales-to-fixed-assets ratio for a new plant of about 1:2. Construction of a major new cement plant today could easily cost $50 million to $100 million. Investment time horizons are long, with two to three years of design and construction time and possibly five to eight years for a new plant to show an operating profit. The practical operating life of a cement plant may be thirty to fifty years, with obsolescence due to size being the chief factor leading to most plant closings. The need for costly pollution control devices has caused a number of older, small plants to close in the past few years, and will cause additional closings by 1975.

PRICES, OPERATING RATES, AND PROFITABILITY

Cement prices vary regionally, largely as a function of the ratio between current installed capacity and current cement consumption in each region. Slow demand growth and some overbuilding in the past have resulted in lower mill net prices in New York and Pennsylvania than in the more rapidly growing areas of the South and West. In 1969 the industry operated at about 82 percent of its stated capacity of 511 million barrels, and in 1970 at about 80 percent of rated capacity, which are about typical of the industry operating rates for the past 30 years.

Partly due to the low operating rates of the industry,

prices and profitability have been low in recent years. Several companies operated at a loss in 1969 and 1970, and few have the 9-11 percent after-tax return on equity generally characteristic of large companies in the United States. The outlook is for demand and utilization rates to improve in 1971 and 1972, with somewhat better prices and profits for the industry.

The overall level of prices improved by about five percent in 1971 prior to the price freeze. Prices will increase further in 1972 if permitted by Phase II controls of the new economic program. Even in this situation, older less efficient plants will be fortunate to recover substantial labor and fuel costs which will occur, while the larger, newer plants with lower unit labor and fuel costs will show satisfactory profitability.

INDUSTRY TRENDS AND PROBLEMS

Cement industry executives are unhappy. Overall demand growth has been and will be slow. Overly optimistic demand forecasts have in the past led to periodic cycles of excess capacity and low prices and profitability. Older, less efficient plants have not been closed rapidly enough, holding down prices in the face of capacity growth. The most recent plant building spree occurred in the late 1950's. It has taken a decade of declining prices (in real terms), unsatisfactory operating rates, and eroding profitability to encourage a balance between new plant building and old plant closings sufficient to achieve a more satisfactory ratio of supply and demand.

In addition to these already severe problems, the impact of the price freeze and increasing public concern over the industry impact on pollution must now be added. The cost of assuring low levels of air pollution, and to a lesser extent water pollution, has recently emerged as an additional financial burden to the industry.

Despite the foregoing, the industry is most emphatically not homogeneous. Individual plants and companies have faced the problems and pursued the opportunities in substantially different ways. Prior to 1960 there were few plants with rated capacity in excess of three million barrels annually. Now there are 18 plants of greater than five million barrels annual capacity. These large plants are attractive primarily because of the significant reductions in unit labor

costs (and to a smaller extent fuel costs) that they permit. Some aggressive firms have chosen to add large increments of new capacity in an effort to offset rising operating costs and price pressures, despite the long investment time horizons and the capital costs involved. Other firms have chosen to continue the operation of existing plants until the industry situation improves, reflecting their different perceptions and perhaps their different financial resources.

An analysis of the size distribution of cement plants in the U.S. for 1950 to 1970 shows that

- as a result of substantial earlier closings, there are now almost no U.S. plants under one million barrels annual capacity (except those for white cement, a low-volume specialty product);
- the number of plants between one and two million barrels has declined steadily from 85 to 48, and is continuing downward;
- there was a rapid increase in plants of two to three million barrels through 1962, but recent closings or expansions have reduced this number from the peak of 64 to 47;
- plants of three to four million barrels have been increasing steadily, to a current total of 42, with a strong continuing trend;
- larger plants, particularly those over five million barrels, have increased steadily and now number 18.

As a result, the average plant size in the industry has risen from 1.78 million barrels in 1950 to 2.86 million barrels in 1970. This trend is expected to continue indefinitely.

Since incremental investment costs are often lower at an existing plant site because of already existing quarry, finished product silos, roads, and buildings, the foregoing changes reflect an increasing trend toward expansion and rebuilding of old plants as well as construction of entirely new plant facilities. The increasing average plant size has allowed the industry to offset largely the sharp rise in

operating labor and fuel costs, and to some extent the rising costs of plant construction.

COMPANY PATTERNS

Despite the attractiveness of large new plants in terms of their operating economics, companies have differed in their willingness (and ability) to build them. Of the 18 facilities above five million barrels in the U.S. today, only one is owned by a company which was among the eight largest in 1950. The others have been built by companies who were not in the cement industry at all then, or were considerably less important than they are today. As a result only two of the leading U.S. cement manufacturers in 1950 hold approximately the same relative position today. Several companies have fallen considerably in market share in that period.

In general, the profitability of a cement plant is a function of its age and size, and its share of the regional market in which it is located. Naturally plants in sparsely populated areas are smaller than those near major metropolitan markets. The plants in the weakest competitive position today are generally those of under three million barrels capacity built in the 1950's or earlier, in a large consumption area. They generally operate at little or no accounting profit over full costs, although they do provide some net cash generation through depreciation and depletion charges. Some of these plants therefore continue to operate even though no one would build another plant of those characteristics today.

As time passes costs continue to rise in these old plants, while prices (which are more closely related to the cost trends of newer, larger plants) rise more slowly. Eventually the owner must decide whether the plant should be closed or substantially rebuilt to obtain the cost advantages of increased scale and automation. This is a difficult investment decision, and is usually faced in terms of

- anticipated demand growth in the area,
- expectations about price levels,
- the value and usability of existing quarry, storage, and other facilities,

- the convenience and economy of the distribution location,

- perceptions of how the increase in capacity would affect competitive responses in the tributary market area,

- ability to finance the required investment, and

- attitudes toward risk, the time value of money, and the attractiveness of diversification investment alternatives.

As demonstrated by an analysis of the investment patterns, profitability, and financial policies of eight leading and probably representative cement companies, major companies have reached significantly different conclusions about the advisability of these relatively large investments. Several large companies appear to be embarked on a policy of steady disinvestment, as low rates of investment, high dividend payouts, and modest debt/equity ratios attest. The result has been steady erosion in market position, a portfolio of older and smaller plants, and a declining rate of profitability. Some are at or near overall loss positions. In some cases this strategy has been accompanied by diversification into unrelated business areas. However, the record shows that the results of diversification have generally been unsatisfactory profits, as companies have often exchanged leading positions in cement markets for marginal positions in new business areas. The Boston Consulting Group believes that share of market is the principal determinant of long term profitability, and that sacrifice of market share is rarely a wise investment choice.

Some of the established companies have continued to invest to maintain or increase relative market position. This has required higher investment, higher debt/equity ratios, and lower dividend payouts. It has generally resulted in higher growth and less erosion in profitability. Some of those companies have also diversified to lessen dependence on the slow and cyclical growth in cement. The result of diversification by this group is also evidently unsatisfactory, for the same reasons as above.

At the same time newcomers have entered the field. These have included

- large ready-mix contractors who have

integrated backwards into cement,

- gypsum and other building products manufacturers,
- foreign cement companies, and
- new companies organized by mining companies and a gas utility.

Several factors may account for the differing perceptions of these newcomers, who invested heavily while many traditional cement companies were minimizing their investment rates. Initially, they may have felt a greater confidence in the cost advantages of large automated plants, and may have been more optimistic about future prices. In addition, however, most of these newcomers have shown a willingness to finance proportionately more heavily with debt funds, using return on shareholders' equity as the principal determinant of investment appeal instead of return on invested assets. They probably also have a longer time horizon, both in terms of initial profits and payoff period. To some extent, these firms may also have been in lower risk businesses (such as the ready-mix companies), and have been dissatisfied with the growth and profit trends in those businesses.

THE CEMENT INDUSTRY AND POLLUTION

The growing national concern about the effects of air and water pollution has led cement companies to increasing levels of spending to hold down emission of pollutants. The main pollutants from cement plants are dust, which consists of very fine particles of cement-like material carried aloft from plant stacks, and water-borne alkalies which are leached from the dust. Pollution control devices generally consist of fabric bag dust collectors (known generally as "bag houses") or electrostatic precipitators. These systems trap the cement dust particles, which arise primarily from the kiln and from the clinker cooler associated with the kiln. In the ten years through 1971, the industry estimates that it has spent approximately $216 million on capital equipment, or about 44 cents per barrel of installed capacity to improve air and water quality.

While these expenditures have done much to improve the overall level of emissions industry-wide, and some plants are now virtually emission-free, more spending is required to clean up existing plants. The Environmental Protection

Agency (EPA), which funded this industry analysis, has estimated that the U.S. cement industry will have to make capital expenditures of an additional $96.6 million for air pollution control, and $25.3 million for water pollution control, to further upgrade facilities built prior to 1967. These amounts are over and above the sums which the EPA projects the industry would have spent anyway, to meet standards existing before those promulgated by the EPA in November of 1971. Moreover, these amounts do not include costs of operation.

Plants built subsequent to 1967 were assumed by the EPA to meet all existing and newly-issued pollution control standards. New plants built after 1971 must meet federal emission standards, which are generally more stringent than previous state standards. The EPA has estimated that the increased cost of meeting these more stringent standards will be about 30 cents per barrel of new capacity installed, again over and above the amounts which would have been spent for pollution controls in any event.

The industry has disputed this argument, generally on the following grounds:

1. Industry leaders do not recognize the distinction between sunk and still-to-be-expended capital costs, and think in terms of "total costs to depollute".

2. The industry projects harsher future state-by-state regulation of existing plants than is contemplated by the EPA, and consequently higher investment costs.

3. They recognize that improved air pollution control increases the disposal problem substantially, especially of particulate material high in alkalies which lead to water pollution, and will add significantly to total control costs.

As a result, many leading cement company executives estimate total capital costs of approximately 88 cents per barrel to depollute. Individual estimates naturally span a fairly wide range, but the average is close to this figure. Of that amount, half or about 44 cents per barrel will have to be expended in the next few years if all existing plants are required to be brought up to projected standards.

Annual operating costs, including depreciation, of air

pollution control facilities are estimated by the EPA at 8-10 cents per barrel; industry estimates would raise the upper figure to perhaps 20 cents per barrel annually.

Based on the EPA estimates, The Boston Consulting Group projects the incremental investment and operating costs will have the following major impacts on the industry:

1. Cement prices will average about two percent higher than would have prevailed in the absence of the additional investments.

2. Total future U.S. cement consumption will not be reduced significantly, since little or no substitution will take place due to higher costs resulting from pollution control expenditures.

3. Imports, which currently represent about three percent of U.S. consumption, will increase; precise estimates of import growth would require a more complete analysis of production, transportation, and depollution costs in key foreign countries.

4. The additional impact on cement industry employment, which has already trended steadily downward in this industry, will be minimal and not concentrated geographically; the Lehigh Valley of Pennsylvania, however, will suffer somewhat more than other areas. Most such displaced employees will have transferable skills (electricians, maintenance, etc.) which will lessen the impact.

5. Closings of already marginal plants will accelerate substantially, as both the capital and the operating costs of depollution will fall more heavily (on a per-barrel basis) on the older, less efficient plants. Approximately 25 cement plant closings can be anticipated in the five years ending 1975, continuing past trends caused by the combined effects of age, competition, and pollution control costs.

6. The relative advantages of larger, newer plants will increase, and virtually all plants of greater than three million barrels will install the required controls. Most plants of greater than 1.8 million barrels located in remote and isolated markets will depollute rather than expand or shut down.

7. The combined effects of plant size advantage, required pollution control expenditures on existing plants, and labor cost pressure will motivate a rate of plant construction in excess of the rate of demand growth, which itself will exceed that of the past decade. The consequence will be a substantial increase in plant construction, virtually all of which will be in plants with kiln sizes of 2.5 million barrels and above.

8. To finance the added investment, the industry will tend to reduce dividends to about one-half of earnings; increase debt/equity ratios, nearly doubling present industry debt in the next five years; and increase prices wherever possible, with overall prices perhaps five percent above their otherwise probable levels. Increased prices will be used to finance growth in preference to increased debt, where allowed, but both foreign and domestic competition will hold back the rates of price increase.

9. The differentiating effects of alternative strategies will become rapidly more apparent, as those companies with withdrawal patterns accelerate their retirements and the more aggressive investors (and probably new companies as well) continue to expand both market coverage and market share.

If the industry estimates of total and anticipated pollution control costs were used, instead of the EPA figures, the foregoing conclusions would not be changed, but would be intensified. In particular, the threshold limit for unprofitably small plant size would be increased, and a larger number of plants would be closed. The rate of plant closings

would be only moderately affected, however, due to the lead time to bring new capacity into being.

INVESTMENT OPPORTUNITY IN THE CEMENT INDUSTRY

The economics of the cement industry appear to be changing with some rapidity. In part, pollution control costs give this trend more impetus. But the economics of cement manufacture are being changed as well by the rising costs of labor versus the declining costs of automation; the improving technology in operation of giant kilns; the changing costs of distribution resulting from terminals and deep-water transport; and the investment economics of large plants, especially those which replace small plants at an existing site.

The cement industry has characteristically been conservative in its financial policies. Dividend payouts have been high, debt ratios low, and prices kept sufficiently high to provide profits even with substantial unused capacity. Yet there is evidence of a new school of thought among some executives in traditional cement companies and companies not historically in this business. New and much more aggressive financial policies are being adopted which place severe pressure on those companies who continue to operate with the traditional patterns.

Foreign competition has become a significant factor, particularly in coastal and border markets. The rate of import growth is accelerating, even as prices soften in response to the increased supply.

Some technological change has taken place in recent years, and a more rapid rate of introducing new technologies seems to be occurring. Up to now, most new technological development has focused on the automated operation of large plants, and in the determination of efficient distribution patterns. Now the focus of technology seems to be on the cement manufacturing process itself, in finding more efficient ways to use fuel and raw materials. It is unlikely that the rotary kiln will be displaced in the foreseeable future, but new technologies may significantly lower process costs.

The combination of these and other factors means that investment opportunities of great magnitude are being created in the cement industry. New forms of competition will continue to force traditional producers out of the business, while those

who capitalize on the opportunities in this pattern of change will be rewarded with substantial profits.

There is no question that the price of competition in the cement industry is rising. Not only are the initial capital costs higher, but the time horizons for profitable operations are lengthening. Only those firms with substantial capital resources and long staying power can afford to participate in most major cement markets. Yet in some ways the critical resources--well-positioned quarries, customer relationships, and experienced labor forces, among others--are possessed by smaller firms with inadequate plants. They do not have the financial resources required to grow and compete. That situation seems likely to lead to a good deal of acquisition and merger activity. This, associated with some withdrawals, will lead to a much more concentrated cement industry, at least in terms of plant ownership.

The potential for high return investments is not lost on many industry leaders and many prospective investors outside the industry. That potential will attract a good deal of investment into this industry during the next decade. The critical controls over success can be identified in advance, but the specifics of each investment opportunity require very sophisticated analysis. They differ a great deal from market to market, because of the wide range of market and competitive characteristics throughout the United States. Some companies will be unwilling or unable to provide that level of planning insight, which will lead to some spectacular losses while other competitors are reaping large rewards.

The upshot of this is that the cement industry may be one of the more exciting industries during the decade of the 1970's--not so much as a result of high growth, but due to high rates of change within the industry. The investment opportunity exists here, as always, in terms of the ability to change competitive positions by the exercise of new and energetic corporate strategies.